Amendments to the Claims:

This listing of claims will replace all prior versions and listings of claims in the application:

1. (Original) A method for controlling a gap in an electrically conducting solid state structure, comprising the steps of:

providing an electrically conducting solid state structure including a gap in the structure;

exposing the structure to a fabrication process environment conditions of which are selected to alter an extent of the gap in the structure;

applying a voltage bias across the gap in the structure during process environment exposure of the structure;

measuring electron tunneling current across the gap during process environment exposure of the structure; and

controlling the process environment during process environment exposure of the structure based on tunneling current measurement.

2. (Original) The method of claim 1 wherein controlling the process environment comprises halting process environment exposure of the structure based on tunneling current measurement.

3. (Original) The method of claim 1 wherein controlling the process environment comprises comparing tunneling current measurement

with a threshold tunneling current corresponding to a prespecified gap extent and controlling the process environment based on the comparison.

4. (Original) The method of claim 1 wherein the conditions of the fabrication process environment are selected to increase an extent of the gap in the structure.

5. (Original) The method of claim 1 wherein the conditions of the fabrication process environment are selected to decrease an extent of the gap in the structure.

6. (Original) The method of claim 1 wherein the fabrication process environment comprises ion beam exposure of the structure.

7. (Original) The method of claim 6 wherein the ion beam exposure comprises blanket ion beam exposure of the structure.

8. (Original) The method of claim 6 wherein the ion beam exposure comprises rastering of the structure by a focused ion beam.

9. (Original) The method of claim 1 wherein the structure comprises two electrically conducting electrodes having a gap between the electrodes.

10. (Original) The method of claim 9 wherein the electrically conducting electrodes are disposed on an electrically insulating membrane including an aperture aligned with the gap between the electrodes.

11. (Original) The method of claim 9 wherein the electrically conducting electrodes are disposed on an electrically insulating surface of a substrate.

12. (Original) A method for controlling a gap between electrically conducting electrodes, comprising the steps of:

providing at least two electrodes on a support structure, each electrode having an electrode tip that is separated from other electrode tips by a gap; and

exposing the electrodes to a flux of ions causing transport of material of the electrodes to corresponding electrode tips, locally adding material of the electrodes to electrode tips in the gap.

13. (Original) The method of claim 12 wherein the support structure comprises a substrate

14. (Original) The method of claim 13 wherein the substrate comprises an electrically insulating surface on which the electrodes are disposed.

15. (Original) The method of claim 12 wherein the support structure comprises a membrane including an aperture aligned with the electrode gap.

16. (Original) The method of claim 12 wherein the support structure comprises a substrate including a trench aligned with the electrode gap.

17. (Original) The method of claim 12 wherein the electrodes comprise metal electrodes.

18. (Original) The method of claim 12 wherein the ion flux exposure of the electrodes comprises blanket ion beam exposure of the electrodes.

19. (Original) The method of claim 12 wherein the ion beam exposure of the electrodes comprises rastering of the electrodes by a focused ion beam.

20. (Original) The method of claim 12 further comprising:

applying a voltage bias across the gap between electrodes during ion flux exposure of the electrodes;

measuring an electron tunneling current across the gap, between electrodes, during ion flux exposure of the electrodes; and

controlling the ion flux exposure of the electrodes during ion flux exposure of the electrodes based on tunneling current measurement.

21. (Original) The method of claim 20 wherein control of the ion flux exposure of the electrodes comprises halting of the ion flux exposure.

22. (New) The method of claim 1 wherein the fabrication process environment comprises electron beam exposure of the structure.

23. (New) The method of claim 9 wherein each electrically conducting electrode is connected in a closed-loop circuit across the gap for measuring electron tunneling across the gap.

24. (New) The method of claim 9 wherein each electrically conducting electrode is disposed in a connection to an electrical contact pad.

25. (New) The method of claim 24 wherein applying a voltage bias across the gap in the structure comprises applying a voltage bias between the electrical contact pads.

26. (New) The method of claim 1 wherein providing an electrically conducting solid state structure including a gap in the structure comprises:

first providing an electrically conducting solid state structure without a gap; and

initiating the fabrication process environment to provide a gap in the solid state structure.

27. (New) The method of claim 1 wherein providing an electrically conducting solid state structure including a gap in the structure comprises:

first providing an electrically conducting solid state structure without a gap; and

initiating a fabrication process environment to provide a gap in the solid state structure that defines two electrically conducting electrodes separated from each other by the gap.

28. (New) The method of claim 27 wherein the exposure of the structure to fabrication process environment increases the extent of the gap between the two electrically conducting electrodes.

29. (New) The method of claim 10 wherein the electrically insulating membrane comprises a silicon nitride membrane.

30. (New) The method of claim 11 wherein the substrate comprises a silicon substrate.

31. (New) The method of claim 1 wherein measuring electron tunneling current comprises amplifying acquired electron tunneling current prior to measuring electron tunneling current.

32. (New) The method of claim 1 wherein measuring electron tunneling current comprises digitizing acquired electron tunneling current prior to measuring electron tunneling current.

33. (New) The method of claim 1 wherein applying a voltage bias across the gap comprises applying across the gap a voltage that is less than a work function that is characteristic of the electrically conducting solid state structure.

34. (New) The method of claim 1 wherein controlling the process environment based on tunneling current measurement comprises:

determining the gap, g, as a function of measured tunneling current, I, and applied voltage bias, V, as:

$$I(V) = aV^2 e^{-b/V}$$

where $a = \dfrac{\sigma e^3}{16\pi^2 \phi \hbar g^2}$ and $b = \dfrac{4(2m_e)^{1/2}\phi^{3/2} g}{3\hbar e}$

and where σ is an area of the solid state structure at opposite sides of the gap, e is the elementary charge, 1.6×10^{-19} C; $\hbar = 1.1 \times 10^{-34}$ J·s; $m_e = 9.1 \times 10^{-31}$ Kg; and ϕ is a work function of the solid state structure at the gap; and

controlling the process environment based on the determined gap.

35. (New) The method of claim 1 wherein controlling the process environment based on tunneling current measurement comprises:

determining the gap, g, as a function of measured tunneling current, I, and applied voltage bias, V, as:

$$I(V) = I_0 e^{-\alpha\sqrt{\phi}g}$$

where $I_0 = \frac{\sigma e^2}{4\pi^2\hbar^2}\frac{\sqrt{2m_e\phi}}{g}V$ and $\alpha = \frac{2\sqrt{2m_e}}{\hbar}$

and where σ is an area of the solid state structure at opposite sides of the gap, e is the elementary charge, 1.6 x 10^{-19} C; $\hbar$ = 1.1 x 10^{-34} J·s; m_e = 9.1 x 10^{-31} Kg; and ϕ is a work function of the solid state structure at the gap; and

controlling the process environment based on the determined gap.